IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS:	Sirohey et al.	) Group Art Unit: 2628
SERIAL NUMBER:	10/711,189	)
FILED:	August 31, 2004	) Examiner Broome, Said A.
FOR:	SYSTEM AND METHOD FOR GENERATING A DIGITAL IMAGE OF AN INTERNAL ANATOMY OF A PERSON	) Confirmation No. 5188

SUBSTITUTE APPEAL BRIEF

Sir:

This Substitute Appeal Brief is submitted in response to the Notification of Non-Compliant Appeal Brief mailed November 5, 2007.

1. THE REAL PARTY IN INTEREST

The real party in interest in this appeal is General Electric Company. Ownership by General Electric Company is established by an assignment document recorded for this application on August 31, 2004, on Reel 015060 and Frame 0749.

2. RELATED APPEALS AND INTERFERENCES

Applicant is not aware of any related appeals or interferences.

3. STATUS OF CLAIMS

Claims 1-15 and 17-50 are currently pending and are the claims on appeal.

Claim 16 has been cancelled.

Claims 1, 19, 21-26, 43 and 45-50 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558.

Claims 2, 4, 27 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Brandl et al., U.S. Patent No. 6,450,962.

Claims 3, 5, 7-15, 28, 30 and 32-41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Brandl et al., U.S. Patent No. 6,450,962, in further view of Yao et al., U.S. Patent Publication No. 2005/0078858.

Claims 6 and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Caoili et al., "Urinary Tract Abnormalities: Initial Experience with Multi-Detector Row CT Urography."

Claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Yanof et al., U.S. Patent Publication No. 2003/0188757.

Claims 18, 20, 42 and 44 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Yao et al., U.S. Patent Publication No. 2005/0078858.

4. STATUS OF AMENDMENTS

Applicant submits that no amendments were filed subsequent to the Final Office Action.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a method for generating a digital image indicative of an internal anatomy of a person. See page 6, paragraph 0024. The method includes scanning the internal anatomy of the person at a plurality of positions along an axis to obtain scanning data, wherein the scanning at each position is performed over at least one respiratory cycle of the person. See page 7, paragraph 0027 and Figure 4, step 134. The method further includes generating a plurality of cross-sectional digital images based on the scanning data. See page 7, paragraph 0028 and Figure 4, step 136. The method further includes generating first and second cross-sectional digital image groups associated with first and second respiratory states, respectively, of the person. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image groups 80, 82, and Figure 4, step 138. The first cross-sectional digital image group includes first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, when the person has the first respiratory state. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image group 80 having digital images 60, 66, and Figure 4, step 138. The second cross-sectional digital image group includes third and fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image group 82 having digital images 62, 68, and Figure 4, step 138. The method further includes generating first and second 3-D digital images utilizing the first and second cross-sectional digital image groups, respectively. See page 8, paragraph 0030, and Figure 3 illustrating 3-D digital images 90, 92 generated from cross-sectional digital image groups 80, 82, respectively, and Figure 4, step 140. The method further includes generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images. See page

8, paragraph 0031, and Figure 4, step 142. The method further includes storing the resultant 3-D digital image in a memory device. See page 6, paragraph 0022.

Dependent claim 2 recites that the method of claim 1 generates the resultant 3-D digital image by performing a minimum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image. See page 9, paragraph 0033 and Figure 5, step 146.

Dependent claim 3 recites that the resultant 3-D digital image of claim 2 includes a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are less than each of the second plurality of voxel intensity values. See page 9, paragraph 0033.

Dependent claim 4 recites that the method of claim 1 generates the resultant 3-D digital image by performing a maximum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image. See page 9, paragraph 0036 and Figure 5, step 152.

Dependent claim 5 recites that the resultant 3-D digital image of claim 4 includes a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are greater than each of the second plurality of voxel intensity values. See page 9, paragraph 0036.

Dependent claim 6 recites that the method of claim 1 generates the resultant 3-D digital image by performing an average intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image. See page 10, paragraph 0040 and Figure 6, step 158.

Dependent claim 7 recites that the method of claim 1 generates the resultant 3-D digital image by performing a maximum intensity projection of the first and second 3-D digital images to obtain a third 3-D digital image, see page 11, paragraph 0047 and Figure 7, step 172; generating a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person, see page 11, paragraph 0048, and Figure 7, step 174; performing a minimum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image, see page 11, paragraph 0049, and Figure 7, step 176; and combining the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image, see page 12, paragraph 0050 and Figure 7, step 178.

Dependent claim 8 recites that the resultant 3-D digital image of claim 7 includes a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being greater than each of the second plurality of voxel intensity values. See page 12, paragraph 0050.

Dependent claim 9 recites that the method of claim 7 further includes color coding a portion of the resultant 3-D digital image; and displaying the color-coded resultant 3-D digital image on a display monitor. See page 13, paragraphs 0057 and 0058.

Dependent claim 10 recites that the method of claim 7 further includes displaying the resultant 3-D digital image on a display monitor using a volume rendering technique. See page 13, paragraph 0058.

Dependent claim 11 recites that the method of claim 7, further includes storing the resultant 3-D digital image in a memory. See page 12, paragraph 0051.

Dependent claim 12 recites that the method of claim 1 generates the resultant 3-D

digital image by performing a minimum intensity projection of the first and second 3-D digital images to obtain a third 3-D digital image, see page 12, paragraph 0053 and Figure 8, step 184; generating a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person, see page 12, paragraph 0054 and Figure 8, step 186; performing a maximum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image, see page 12, paragraph 0055 and Figure 8, step 188; and combining the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image, see page 13, paragraph 0056, and Figure 8, step 190.

Dependent claim 13 recites that the resultant 3-D digital image of claim 12 includes a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being less than each of the second plurality of voxel intensity values. See page 13, paragraph 0056.

Dependent claim 14 recites that the method of claim 12 further includes color coding a portion of the resultant 3-D digital image; and displaying the color-coded resultant 3-D digital image on a display monitor. See page 13, paragraphs 0057 and 0058.

Dependent claim 15 recites that the method of claim 12 further includes displaying the resultant 3-D digital image on a display monitor using a volume rendering technique. See page 13, paragraphs 0057 and 0058.

Dependent claim 17 recites that the method 1 scans the internal anatomy of the person and monitors a position on a chest of the person during respiration by the person to determine the time period of the respiratory cycle of the person. See page 5, paragraph 5.

Dependent claim 18 recites that the method of claim 1 wherein the at least a portion of the internal anatomy of the person comprises a tumor. See page 9, paragraph 0033 and

Figure 3, tumor 76.

Dependent claim 20 recites the method of claim 1 wherein the plurality of cross-sectional digital images comprises a plurality of magnetic resonance images. See page 6, paragraph 0024.

Independent claim 26 is directed to a system for generating a digital image indicative of an internal anatomy of a person. See page 6, paragraph 0024 and Figure 1 illustrating system 20. The system includes a respiratory monitoring device generating a first signal indicative of a respiratory state of the person. See page 5, paragraph 0021 and Figure 1 illustrating respiratory monitoring device 48. The system further includes a scanning device configured to scan an internal anatomy of the person to obtain scanning data. See page 4, paragraphs 0013 and 0014 and Figure 1 illustrating a device having x-ray source 22 and x-ray detector array 24. The system further includes a computer operably coupled to both the respiratory monitoring device and the scanning device. See page 5, paragraph 0022 and Figure 1 illustrating computer 34. The computer is configured to generate a plurality of cross-sectional digital images based on the scanning data. See page 7, paragraph 0028 and Figure 4, step 136. The computer is further configured to generate first and second cross-sectional digital image groups associated with the first and second respiratory states, respectively, of the person. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image groups 80, 82, and Figure 4, step 138. The first cross-sectional digital image group includes first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, when the person has the first respiratory state. See page 7, paragraph 0029, and Figure 3 illustrating digital images 60, 66 in cross-sectional digital image group 80, and Figure 4, step 138. The second cross-sectional digital image group includes third and fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state. See page 7, paragraph 0029, and Figure 3 illustrating digital images 62, 68 in cross-sectional digital image group 82, and Figure 4, step 138. The computer is further configured to generate first and second 3-D digital images utilizing the first and second

cross-sectional digital image groups, respectively. See page 8, paragraph 0030, and Figure 3 illustrating 3-D digital images 90, 92 generated from cross-sectional digital image groups 80, 82, respectively, and Figure 4, step 140. The computer is further configured to generate a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images. See page 8, paragraph 0031, and Figure 4, step 142. The computer is further configured to store the resultant 3-D digital image in a memory device. See page 6, paragraph 0022.

Dependent claim 27 recites that the computer of the system of claim 26 is further configured to perform a minimum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image. See page 9, paragraph 0033 and Figure 5, step 146.

Dependent claim 28 recites that the resultant 3-D digital image of claim 27 includes a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are less than each of the second plurality of voxel intensity values. See page 9, paragraph 0033.

Dependent claim 29 recites that the computer of the system of claim 26 is further configured to perform a maximum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image. See page 9, paragraph 0036 and Figure 5, step 152.

Dependent claim 30 recites that the resultant 3-D digital image of the system of claim 29 includes a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are greater than each of the second plurality of voxel intensity values. See page 9, paragraph 0036.

Dependent claim 31 recites that the computer of the system of claim 26 is further configured to perform an average intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image. See page 10, paragraph 0040 and Figure 6, step 158.

Dependent claim 32 recites that the computer of the system of claim 26 is further configured to perform a maximum intensity projection of first and second 3-D digital images to obtain a third 3-D digital image, see page 11, paragraph 0047 and Figure 7, step 172; the computer being further configured to generate a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person, see page 11, paragraph 0048, and Figure 7, step 174; the computer being further configured to perform a minimum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image, see page 11, paragraph 0049, and Figure 7, step 176; and the computer being further configured to combine the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image, see page 12, paragraph 0050 and Figure 7, step 178.

Dependent claim 33 recites that resultant 3-D digital image of the system of claim 32 includes a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle, and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being greater than each of the second plurality of voxel intensity values. See page 12, paragraph 0050.

Dependent claim 34 recites that the computer of the system of claim 32 is further configured to color code a portion of the resultant 3-D digital image and to display the color-coded resultant 3-D digital image on a display monitor. See page 13, paragraphs 0057 and 0058.

Dependent claim 35 recites that the system of claim 32 further displays the resultant 3-D digital image on a display monitor using a volume rendering technique. See page 13,

paragraph 0058.

Dependent claim 36 recites that the system of claim 32 further stores the resultant 3-D digital image in a memory. See page 12, paragraph 0051.

Dependent 37 recites that the computer of the system of claim 26 is further configured to perform a minimum intensity projection of the first and second 3-D digital images to obtain a third 3-D digital image, see page 12, paragraph 0053 and Figure 8, step 184; the computer being further configured to generate a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person, see page 12, paragraph 0054 and Figure 8, step 186; the computer being further configured to perform a maximum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image, see page 12, paragraph 0055 and Figure 8, step 188; and the computer being further configured to combine the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image, see Page 13, paragraph 0056, and Figure 8, step 190.

Dependent claim 38 recites that the resultant 3-D digital images of the system of claim 37 includes a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being less than each of the second plurality of voxel intensity values. See page 13, paragraph 0056.

Dependent claim 39 recites that the computer of the system of claim 37 is further configured to color code a portion of the resultant 3-D digital image, and to display the color-coded resultant 3-D digital image on a display monitor. See page 13, paragraphs 0057 and 0058.

Dependent claim 40 recites that the computer of the system of claim 37 is further configured to display the resultant 3-D digital image on a display monitor using a volume

rendering technique. See page 13, paragraphs 0057 and 0058.

Dependent claim 41 recites that the computer of the system of claim 37 is further configured to store the resultant 3-D digital image in a memory. See page 5, paragraph 0022.

Dependent claim 42 recites the system of claim 26 wherein the at least a portion of the internal anatomy of the person comprises a tumor. See page 9, paragraph 0033 and Figure 3, tumor 76.

Dependent claim 44 recites the system of claim 26 wherein the plurality of cross-sectional digital images comprises magnetic resonance images. See page 6, paragraph 0024.

Independent claim 50 is directed to an article of manufacture. The article of manufacture includes a computer storage medium having a computer program encoded therein for generating a digital image indicative of an internal anatomy of a person. See page 13, paragraph 13. The computer storage medium includes code for inducing a scanning device to scan the internal anatomy of the person at a plurality of positions along an axis to obtain scanning data, wherein the scanning at each position is performed over at least one respiratory cycle of the person. See page 7, paragraph 0027 and Figure 4, step 134. The computer storage medium further includes code for generating a plurality of cross-sectional digital images based on the scanning data. See page 7, paragraph 0028 and Figure 4, step 136. The computer storage medium further includes code for generating first and second cross-sectional digital image groups associated with the first and second respiratory states, respectively, of the person. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image groups 80, 82, and Figure 4, step 138. The first cross-sectional digital image group includes first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, when the person has the first respiratory state. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image group 80 having digital images 60, 66, and Figure 4, step 138. The second cross-sectional digital image group includes third and

fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state. See page 7, paragraph 0029, and Figure 3 illustrating cross-sectional digital image group 82 having digital images 62, 68, and Figure 4, step 138. The computer storage medium further includes code for generating first and second 3-D digital images utilizing the first and second cross-sectional digital image groups, respectively. See page 8, paragraph 0030, and Figure 3 illustrating 3-D digital images 90, 92 generated from cross-sectional digital image groups 80, 82, respectively, and Figure 4, step 140. The computer storage medium further includes code for generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images. See page 8, paragraph 0031, and Figure 4, step 142. The computer storage medium further includes code for storing the resultant 3-D digital image in a memory device. See page 6, paragraph 0022 and Figure 1 illustrating memory unit 44.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether the claims 1, 19, 21-26, 43 and 45-50 are unpatentable under 35 U.S.C. §103(a) over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558.

Whether the claims 2, 4, 27 and 29 are unpatentable under 35 U.S.C. §103(a) over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Brandl et al., U.S. Patent No. 6,450,962.

Whether the claims 3, 5, 7-15, 28, 30 and 32-41 are unpatentable under 35 U.S.C. §103(a) over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Brandl et al., U.S. Patent No. 6,450,962, in further view of Yao et al., U.S. Patent Publication No. 2005/0078858.

Whether the claims 6 and 31 are unpatentable under 35 U.S.C. §103(a) over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Caoili et al., "Urinary Tract Abnormalities: Initial Experience with Multi-Detector Row CT Urography."

Whether the claim 17 is unpatentable under 35 U.S.C. §103(a) over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Yanof et al., U.S. Patent Publication No. 2003/0188757.

Whether the claims 18, 20, 42 and 44 are unpatentable under 35 U.S.C. §103(a) over Takagi et al., U.S. Patent No. 6,269,140, in view of Claus et al., U.S. Patent Publication No. 2005/0135558, in further view of Yao et al., U.S. Patent Publication No. 2005/0078858.

7. ARGUMENT

A. THE EXAMINER'S REJECTION OF CLAIMS 1, 19, 21-26, 43 AND 45-50 UNDER 35 U.S.C. §103(a) IS IMPROPER

The Examiner's rejection of claims 1, 19, 21-26, 43 and 45-50 under 35 U.S.C. 103(a) is improper because the Examiner has not identified any proper motivation for the proposed combination of references and the combination of references do not teach each and every limitation of the claims.

i. The Examiner's rejection of claims 1, 19, 21-26, 43 and 45-50 is improper because the Examiner has not identified any proper motivation for the proposed combination of Takagi et al. and Claus et al.

Applicant notes that claims 1, 19, 21-26, 43 and 45-50 stand or fall together as a group.

Referring to Takagi et al., the reference is directed to a system that generates a plurality of 2-D CT images and then generates a 3-D image based on the plurality of 2-D CT images. See Takagi et al., column 5, lines 63-67 and column 6, lines 1-3, and column 6, lines 59-65. Referring to Claus et al, the reference is directed to a system that generates a plurality of 2-D fluoroscopy images then generates a 3-D image based on the plurality of 2-D fluoroscopy images. See page 1, paragraph 0003 and paragraph 0008.

However, since the system of Takagi et al. can already generate a 3-D image based on a plurality of 2-D CT images, one skilled in the art would have no motivation to combine the teachings of Claus et al. with Takagi et al. to obtain a 3-D image. Further, the 2-D fluoroscopy images generally have a relatively high noise that can lead to image distortion. See Claus et al., column 1, paragraph 3. Accordingly, the proposed combination would actually impair the clarity of images generated by the Takagi et al. reference.

Because no proper motivation has been identified for the proposed combination, applicant submits that the rejection of claims 1, 19, 21-26, 43 and 45-50 based on Takagi et al. and Claus et al. under 35 U.S.C. §103(a) is improper.

ii. The Examiner's rejection of claims 1, 19, 21-26, 43 and 45-50 improper because the proposed combination of Takagi et al. and Claus et al. does not teach each and every limitation of the claims

Referring to independent claim 1, the claim recites in part:

"...generating first and second cross-sectional digital image groups associated with first and second respiratory states, respectively, of the person, the first cross-sectional digital image group including first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, when the person has the first respiratory state, the second cross-sectional digital image group including third and fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state;

generating first and second 3-D digital images utilizing the first and second cross-sectional digital image groups, respectively; and

generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images; and

storing the resultant 3-D digital image in a memory device."

As noted by the Examiner, Takagi et al. fails to teach "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1, and similarly recited in independent claims 26 and 50. See Final Office Action, page 4, lines 14-16. Applicant concurs with the foregoing assertion.

Referring to Claus et al., the reference is directed to a system that generates a plurality of 2-D fluoroscopy images then generates a 3-D image based on the plurality of 2-D fluoroscopy images. See page 1, paragraph 0003 and paragraph 0008. However, Claus

et al. does not provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited independent claim 1. Accordingly, the Examiner has clearly misconstrued the teachings of Claus et al.

Accordingly, because the combination of Takagi et al. and Claus et al. does not teach each and every limitation of independent claims 1, 26 and 50, and claims 19, 21-25, 43, and 45-49 which depend from one of claims 1, 26, 50, applicant submits that the rejection of claims 1, 19, 21-26, 43 and 45-50 based on Takagi et al. and Claus et al. under 35 U.S.C. §103(a) is improper.

B. THE EXAMINER'S REJECTION OF CLAIMS 2, 4, 27 AND 29 UNDER 35 U.S.C. §103(a) IS IMPROPER

The Examiner's rejection of claims 2, 4, 27 and 29 under 35 U.S.C. 103(a) is improper because the combination of Takagi et al., Clause et al., and Brandl et al. does not teach each and every limitation of the claims. Claims 2, 4, 27 and 29 stand or fall together as a group.

Referring to dependent claim 2, the claim recites: "The method of claim 1, wherein generating the resultant 3-D digital image comprises: performing a minimum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image." Dependent claim 27 recites similar limitations.

As discussed above, neither Takagi et al. nor Claus et al. provide any teaching of "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26.

Referring to Brandl et al., the reference does recite: "the volume rendering algorithms used in accordance with certain embodiments of the present invention to combine adjacent image planes 34 include the following general types: maximum intensity projection, minimum intensity projection, and surface rendering using fuzzy segmentation

in combination with either the voxel texture information, the depth information, gradient shading and the like. See Brandl et al., column 4, lines 63-67 and column 5, lines 1-9.

Brandl et al., however, does not provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and dependent claims 2 and 4, and similarly recited in independent claim 27 and dependent claim 29. In contrast, Brandl et al. generates a plurality of 2-D image planes 34. See Brandl et al., Figure 2.

Further, Brandl et al. does not provide any teaching of: "performing a minimum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image", as recited in dependent claim 2 and similarly recited in claim 27. In contrast, Brandl et al. performs minimum intensity projection on adjacent 2-D image planes. See Brandl et al., column 4, lines 64-67.

Referring to dependent claim 4, the claim recites: "The method of claim 1, wherein generating the resultant 3-D digital image comprises: performing a maximum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image." Dependent claim 29 recites similar limitations.

Brandl et al., however, does not provide any teaching of "performing a maximum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image", as recited in dependent claim 4, and similarly recited in dependent claim 29. In contrast, Brandl et al. performs maximum intensity projection on adjacent 2-D image planes. See Brandl et al., column 4, lines 64-67.

Accordingly, because the combination of Takagi et al., Claus et al., and Brandl et al. does not teach each and every limitation of independent claims 1 and 26, and dependent claims, 2, 4, 27 and 29 which depend from one of claims 1 and 26, applicant submits that the rejection of claims 2, 4, 27 and 29 based on these references under 35 U.S.C. §103(a) is improper.

C. THE EXAMINER'S REJECTION OF CLAIMS 3, 5, 7-15, 28, 30, AND 32-41 UNDER 35 U.S.C. §103(a) IS IMPROPER

The Examiner's rejection of claims 3, 5, 7-15, 28, 30 and 32-41 under 35 U.S.C. 103(a) is improper because the combination of Takagi et al., Clause et al., Brandl et al. and Yao et al. does not teach each and every limitation of the claims. Claims 3, 5, 7-15, 28, 30 and 32-41 stand or fall together as a group.

Applicant notes that claims 3, 5 and 7-15 depend from independent claim 1 and include all of the limitations of claim 1. Further, claims 28, 30 and 32-41 depend from independent claim 26 and include all the limitations of claim 26.

As discussed above, neither Takagi et al. nor Claus et al. nor Brandl et al. provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26. Further, Yao et al. does not provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26.

Accordingly, because the combination of Takagi et al., Claus et al., Brandl et al., and Yao et al. does not teach each and every limitation of independent claims 1 and 26, and dependent claims 3, 5, 7-15, 28, 30 and 32-41 which depend from one of claims 1 and 26, applicant submits that the rejection of claims 3, 5, 7-15, 28, 30 and 32-41 based on these references under 35 U.S.C. §103(a) is improper.

D. THE EXAMINER'S REJECTION OF CLAIMS 6 AND 31 UNDER 35 U.S.C. §103(a) IS IMPROPER

The Examiner's rejection of claims 6 and 31 under 35 U.S.C. 103(a) is improper because the combination of Takagi et al., Clause et al., Caoili et al. does not teach each and every limitation of the claims. Claims 6 and 31 stand or fall together as a group.

Applicant notes that claim 6 depends from independent claim 1 and includes all of

the limitations of claim 1. Further, claim 31 depends from independent claim 26 and includes all the limitations of claim 26.

As discussed above, neither Takagi et al. nor Claus et al. provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26. Further, Caoili et al. does not provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26.

Accordingly, because the combination of Takagi et al., Claus et al., and Caoili et al. does not teach each and every limitation of independent claims 1 and 26, and dependent claims 6 and 31 which depend from claims 1 and 26, respectively, applicant submits that the rejection of claims 6 and 31 based on these references under 35 U.S.C. §103(a) is improper.

E. THE EXAMINER'S REJECTION OF CLAIM 17 UNDER 35 U.S.C. §103(a) IS IMPROPER

The Examiner's rejection of claim 17 under 35 U.S.C. 103(a) is improper because the combination of Takagi et al., Clause et al. and Yanof et al. does not teach each and every limitation of the claim 17. Claim 17 stands or falls by itself.

Applicant notes that claim 17 depends from independent claim 1 and includes all of the limitations of claim 1.

As discussed above, neither Takagi et al. nor Claus et al. provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26. Further, Yanof et al. does not provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D

digital images", as recited in independent claim 1.

Accordingly, because the combination of Takagi et al., Claus et al., and Yanof et al. does not teach each and every limitation of independent claim 1, and dependent claim 17 which depends from claim 1, applicant submits that the rejection of claim 17 based on these references under 35 U.S.C. §103(a) is improper.

F. THE EXAMINER'S REJECTION OF CLAIMS 18, 20, 42, 44 UNDER 35 U.S.C. §103(a) IS IMPROPER

The Examiner's rejection of claims 18, 20, 42 and 44 under 35 U.S.C. 103(a) is improper because the combination of Takagi et al., Clause et al., and Yao et al. does not teach each and every limitation of the claim 17. Claims 18, 20, 42 and 44 stand or fall as a group.

Applicant notes that claims 18 and 20 depend from independent claim 1 and include all of the limitations of claim 1. Further, claims 42 and 44 depend from independent claim 26 and include all of the limitations of claim 26.

As discussed above, neither Takagi et al. nor Claus et al. provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26. Further, Yao et al. does not provide any teaching of: "generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images", as recited in independent claim 1 and similarly recited in independent claim 26.

Accordingly, because the combination of Takagi et al., Claus et al., and Yao et al. does not teach each and every limitation of independent claims 1 and 26, and dependent claims 18, 20, 42 and 44 which depend from one of claims 1 and 26, applicant submits that the rejection of claims 18, 20, 42 and 44 based on these references under 35 U.S.C. §103(a) is improper.

G. CONCLUSION

In view of the foregoing arguments, applicant respectfully submits that the recited claims are novel and unobvious. Further, a reversal of the rejections of record, or such recommendation or relief as equity may require, is respectfully requested.

Respectfully Submitted,

By 
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CLAIMS APPENDIX

1. A method for generating a digital image indicative of an internal anatomy of a person, comprising:

scanning the internal anatomy of the person at a plurality of positions along an axis to obtain scanning data, wherein the scanning at each position is performed over at least one respiratory cycle of the person;

generating a plurality of cross-sectional digital images based on the scanning data;

generating first and second cross-sectional digital image groups associated with first and second respiratory states, respectively, of the person, the first cross-sectional digital image group including first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, when the person has the first respiratory state, the second cross-sectional digital image group including third and fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state;

generating first and second 3-D digital images utilizing the first and second cross-sectional digital image groups, respectively; and

generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images; and

storing the resultant 3-D digital image in a memory device.

2. The method of claim 1, wherein generating the resultant 3-D digital image comprises:

performing a minimum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image.

3. The method of claim 2, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are less than each of the second plurality of voxel intensity values.

4. The method of claim 1, wherein generating the resultant 3-D digital image comprises:

performing a maximum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image.

5. The method of claim 4, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are greater than each of the second plurality of voxel intensity values.

6. The method of claim 1, wherein generating the resultant 3-D digital image comprises:

performing an average intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image.

7. The method of claim 1, wherein generating the resultant 3-D digital image comprises:

performing a maximum intensity projection of the first and second 3-D digital images to obtain a third 3-D digital image;

generating a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person;

performing a minimum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image; and

combining the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image.

8. The method of claim 7, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being greater than each of the second plurality of voxel intensity values.

9. The method of claim 7, further comprising:

color coding a portion of the resultant 3-D digital image; and displaying the color-coded resultant 3-D digital image on a display monitor.

10. The method of claim 7, further comprising displaying the resultant 3-D digital image on a display monitor using a volume rendering technique.

11. The method of claim 7, further comprising storing the resultant 3-D digital image in a memory.

12. The method of claim 1, wherein generating the resultant 3-D digital image comprises:

performing a minimum intensity projection of the first and second 3-D digital images to obtain a third 3-D digital image;

generating a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person;

performing a maximum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image; and

combining the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image.

13. The method of claim 12, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being less than each of the second plurality of voxel intensity values.

14. The method of claim 12, further comprising:

color coding a portion of the resultant 3-D digital image; and

displaying the color-coded resultant 3-D digital image on a display monitor.

15. The method of claim 12, further comprising displaying the resultant 3-D digital image on a display monitor using a volume rendering technique.

17. The method of claim 1, wherein scanning the internal anatomy of the person comprises monitoring a position on a chest of the person during respiration by the person to determine the time period of the respiratory cycle of the person.

18. The method of claim 1, wherein the at least a portion of the internal anatomy of the person comprises a tumor.

19. The method of claim 1, wherein the plurality of cross-sectional digital images comprises a plurality of computerized tomography images.

20. The method of claim 1, wherein the plurality of cross-sectional digital images comprises a plurality of magnetic resonance images.

21. The method of claim 1, wherein the first and second 3-D digital images comprises first and second 3-D computerized tomography images, respectively.

22. The method of claim 1, further comprising displaying at least a portion of the resultant 3-D digital image on a display monitor.

23. The method of claim 1, further comprising displaying a 2-D portion of the resultant 3-D digital image on a display monitor.

24. The method of claim 1, further comprising:

color coding a portion of the resultant 3-D digital image; and

displaying the color-coded resultant 3-D digital image on a display monitor.

25. The method of claim 24, wherein the color-coded resultant 3-D digital image is generated using a volume rendering display technique.

26. A system for generating a digital image indicative of an internal anatomy of a person, comprising:

a respiratory monitoring device generating a first signal indicative of a respiratory state of the person;

a scanning device configured to scan an internal anatomy of the person to obtain scanning data; and

a computer operably coupled to both the respiratory monitoring device and the scanning device, the computer configured to generate a plurality of cross-sectional digital images based on the scanning data, the computer further configured to generate first and second cross-sectional digital image groups associated with the first and second respiratory states, respectively, of the person, the first cross-sectional digital image group including first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, when the person has the first respiratory state, the second cross-sectional digital image group including third and fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state, the computer further configured to generate first and second 3-D digital images utilizing the first and second cross-sectional digital image groups, respectively, the computer further configured to generate a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images, the computer further configured to store the resultant 3-D digital image in a memory device.

27. The system of claim 26, wherein the computer is further configured to perform a minimum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image.

28. The system of claim 27, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are less than each of the second plurality of voxel intensity values.

29. The system of claim 26, wherein the computer is further configured to perform a maximum intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image.

30. The system of claim 29, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of a tumor and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, wherein each of the first plurality of voxel intensity values are greater than each of the second plurality of voxel intensity values.

31. The system of claim 26, wherein the computer is further configured to perform an average intensity projection of the first and second 3-D digital images to obtain the resultant 3-D digital image.

32. The system of claim 26, wherein the computer is further configured to perform a maximum intensity projection of first and second 3-D digital images to obtain a third 3-D digital image;

the computer being further configured to generate a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person;

the computer being further configured to perform a minimum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image; and

the computer being further configured to combine the third 3-D digital image and the fourth 3-D digital image to obtain the resultant 3-D digital image.

33. The system of claim 32, wherein the resultant 3-D digital image comprises a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle, and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being greater than each of the second plurality of voxel intensity values.

34. The system of claim 32, wherein the computer is further configured to color code a portion of the resultant 3-D digital image and to display the color-coded resultant 3-D digital image on a display monitor.

35. The system of claim 32, further comprising displaying the resultant 3-D digital image on a display monitor using a volume rendering technique.

36. The system of claim 32, further comprising storing the resultant 3-D digital image in a memory.

37. The system of claim 26, wherein the computer is further configured to perform a minimum intensity projection of the first and second 3-D digital images to obtain a third 3-D digital image;

the computer being further configured to generate a boundary within the third 3-D digital image around a predetermined portion of the internal anatomy of the person;

the computer being further configured to perform a maximum intensity projection of the predetermined portion of the third 3-D digital image to obtain a fourth 3-D digital image; and

the computer being further configured to combine the third 3-D digital image and the -fourth 3-D digital image to obtain the resultant 3-D digital image.

38. The system of claim 37, wherein the resultant 3-D digital images comprises a first region having a first plurality of voxel intensity values indicative of locations of a tumor during at least one respiratory cycle and a second region having a second plurality of voxel intensity values indicative of the internal anatomy surrounding the tumor, the first plurality of voxel intensity values being less than each of the second plurality of voxel intensity values.

39. The system of claim 37 wherein the computer is further configured to color code a portion of the resultant 3-D digital image, and to display the color-coded resultant 3-D digital image on a display monitor.

40. The system of claim 37, wherein the computer is further configured to display the resultant 3-D digital image on a display monitor using a volume rendering technique.

41. The system of claim 37, wherein the computer is further configured to store the resultant 3-D digital image in a memory.

42. The system of claim 26, wherein the at least a portion of the internal anatomy of the person comprises a tumor.

43. The system of claim 26, wherein the plurality of cross-sectional digital images comprises a plurality of computerized tomography images.

44. The system of claim 26, wherein the plurality of cross-sectional digital images comprises magnetic resonance images.

45. The system of claim 26, wherein the first and second 3-D digital images comprise first and second 3-D computerized tomography images, respectively.

46. The system of claim 26, wherein the computer is further configured to display at least a portion of the resultant 3-D digital image on a display monitor.

47. The system of claim 26, wherein the computer is further configured to display a 2-D portion of the resultant 3-D digital image on a display monitor.

48. The system of claim 26, wherein the computer is further configured color code a portion of the resultant 3-D digital image and to display the color-coded resultant 3-D digital image on a display monitor.

49. The system of claim 48, wherein the color-coded resultant 3-D digital image is generated using a volume rendering display function.

50. An article of manufacture, comprising:

a computer storage medium having a computer program encoded therein for generating a digital image indicative of an internal anatomy of a person, the computer storage medium comprising:

code for inducing a scanning device to scan the internal anatomy of the person at a plurality of positions along an axis to obtain scanning data, wherein the scanning at each position is performed over at least one respiratory cycle of the person;

code for generating a plurality of cross-sectional digital images based on the scanning data;

code for generating first and second cross-sectional digital image groups associated with the first and second respiratory states, respectively, of the person, the first cross-sectional digital image group including first and second digital images of the plurality of cross-sectional digital images obtained at first and second positions, respectively, along the axis, the when the person has the first respiratory state, the second cross-sectional digital image group including third and fourth digital images of the plurality of cross-sectional digital images obtained at third and fourth positions, respectively, along the axis, when the person has the second respiratory state;

code for generating first and second 3-D digital images utilizing the first and second cross-sectional digital image groups, respectively;

code for generating a resultant 3-D digital image indicating at least a portion of the internal anatomy of the person utilizing the first and second 3-D digital images; and

code for storing the resultant 3-D digital image in a memory device.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

Applicant is not aware of any related appeals or interferences.